Story by Danielle Kalisek

THE ENDING OF AN ERA

After more than 10 years, the Rio Grande Basin Initiative concludes

The Rio Grande near the river diversion point for the Delta Lake Irrigation District office in Edcouch, Texas. Photo by Danielle Kalisek.

Scientists with the Rio Grande Basin Initiative used aquatic weed control methods and herbicides to control invasive water plants such as water hyacinth, pictured. Photo by Danielle Kalisek.

Editor's Note: Writer Danielle Kalisek has managed the Rio Grande project for the past eight years. The information below is collected from her experiences of working with the project and its participants and includes quotes from project members.

The beginning of the era

The Rio Grande Basin is one of the most productive agricultural areas in the United States, and irrigated agriculture claims more than 85 percent of the basin's water. Persistent drought in the basin and predicted population growth will continue to strain limited water supplies both for agricultural irrigation and urban water consumption.

In 2001 the *Efficient Irrigation for Water Conservation in the Rio Grande Basin initiative*, also known as the *Rio Grande Basin Initiative* (RGBI), began to address these supply problems with a team of researchers, extension specialists and county agents from Texas A&M AgriLife and the New Mexico State University College of Agriculture and Home Economics. After 12 years of continued successful efficient irrigation and water-conserving efforts, the federally funded project ended in July 2013, but much of the water conservation work that was initiated continues.

Over the years, about 145 researchers and extension workers in Texas and New Mexico received grants through RGBI. Project personnel worked with local irrigation districts, agricultural producers, homeowners and others. Efforts focused on nine areas: 1) irrigation district studies; 2) irrigation education and training; 3) institutional incentives for efficient water use; 4) on-farm irrigation system management; 5) urban water conservation; 6) environment, ecology and water quality protection; 7) saline and wastewater management and water reuse; 8) basinwide hydrology, salinity modeling and technology; and 9) communications and accountability.

The RGBI project was funded through the U.S. Department of Agriculture National Institute of Food and Agriculture (NIFA) and administered by the Texas Water Resources Institute and the New Mexico State University Water Task Force.

Expanding impacts

The RGBI project has affected not only those living in the basin — farmers, homeowners, youth — but also the researchers and extension personnel involved in the project. In many cases, RGBI research conducted at Texas A&M AgriLife Research and Extension Centers has been taken to farmers and implemented in their fields for comparison studies. Those involved in the project held educational events to teach homeowners and youth about in-home and landscape water conservation measures they can take to save water and dollars. RGBI funding has helped support numerous students, researchers and extension personnel and has helped add leverage to secure additional funding. All these accomplishments have formed a foundation for future projects. A major contribution of the RGBI project, beyond conserving dramatic quantities of water, is training the next generation of water scientists.

"It has helped us develop great relationships with irrigation districts and New Mexico faculty, and it has facilitated the adoption of water-conserving technologies," said Dr. Ronald Lacewell, RGBI project participant and assistant vice chancellor of federal relations at Texas A&M AgriLife.

"RGBI put minds, talents and experiences to work together in common water conservation goals," said Dr. Daniel Leskovar, professor and center director at the Texas A&M AgriLife Research and Extension Center at Uvalde. "It excelled in engaging groups collectively — multidisciplinary, multicollaborative and multi-institutional — in critical research, education and extension water programs."

Dr. Shad Nelson, associate professor at Texas A&M University–Kingsville, attributes RGBI funding to his start in citrus research. "RGBI helped to solidify my career in Texas as well as provided meaningful impacts to the citrus growers of South Texas. Farmers have been able to showcase water-saving practices to other growers." ⇨

"The RGBI program not only helped to establish a strong foundation for my research programs, but also encouraged me to expand the scope of my research program by [helping me leverage] external funds," said Dr. Zhuping Sheng, associate professor at Texas A&M AgriLife Research and Extension Center at El Paso.

By financially supporting personnel, RGBI projects have also supported students. In particular, Nelson's funds supported six graduate students who have all continued into agriculture-related jobs or at federal agencies such as USDA. Lacewell's funds supported 10 agricultural economics graduate students and three undergraduates working on his projects.

Putting initiative results into action

Technology transfer and implementation continues in the basin as a result of RGBI efforts.

"The RGBI project has helped us begin to understand the complex water interactions of the Rio Grande Basin," said Blair Stringam, assistant professor and RGBI project director at New Mexico State University. "We are beginning to understand groundwater and surface water interaction as well as evapotranspiration and surface water losses. We hope to gain additional understanding in the future."

"The RGBI project has been instrumental in allowing citrus growers in the Lower Rio Grande Valley see that alternative irrigation methods can be implemented now and provides high economic returns while saving 35 percent [irrigation] water," Nelson said.

"Technology adoption certainly has occurred in a major portion of the farming community," Leskovar said. "Farmers and citizens have a better understanding of the value and volume of water used for food production."

These adoptions and efficient technology transfers include center pivot and LEPA irrigation systems, weather data, sensing technologies, drought-tolerant field crops and high-value specialty crops, he said.

Highlighted Findings & Implemented Results

Accountability and communications were high priorities of this project. Starting in 2003, an annual progress and accomplishments report was published, highlighting that year's results and efforts of the project participants. These reports show that project efforts conserved roughly 500,000 acre-feet of water per year, leaving more available for other users, such as municipalities, or for farmers to use in other fields. In addition, farmers, irrigation district managers, homeowners and others saved about $500,000 annually by implementing more efficient methodologies or infrastructure or adopting water-conserving practices. The team produced more than 1,500 publications from these efforts.

Selected accomplishments

Infrastructure evaluations of seepage losses found that linings in irrigation canals saved 47–800 acre-feet per mile or 10–30 percent of water delivered. Lining 10 miles of canal in El Paso would save enough water for 1,000 acres of irrigated crops or 8,000 households.

Economic analysis of 15 federally authorized irrigation district projects with the RGIDECON© model showed estimated savings of 49,392 acre-feet of water per year with cost of saving water ranging from $16 to $119 per acre-foot.

Engineers, working with irrigation districts, completed GIS maps of irrigation delivery systems in the upper and lower Rio Grande basins. These provide an indispensable tool to district personnel for district planning and modernization.

Scientists working with state and federal agencies and commodity groups demonstrated productive and safe use of graywater and brackish water for the production of irrigated vegetables.

The Landscape Irrigation Auditing and Management Program received EPA's WaterSense® certification. Students who complete the course and pass the certification exam become WaterSense Certified Landscape Irrigation Auditors. Training events were conducted, providing certification to licensed irrigators, water utility personnel and other landscape professionals.

Dr. Juan Enciso, associate professor at the Texas A&M AgriLife Research and Extension Center at Weslaco, added that drip irrigation has increased in West Texas due to these project efforts and more farmers have implemented the use of polypipe and leveling on their lands to irrigate more efficiently.

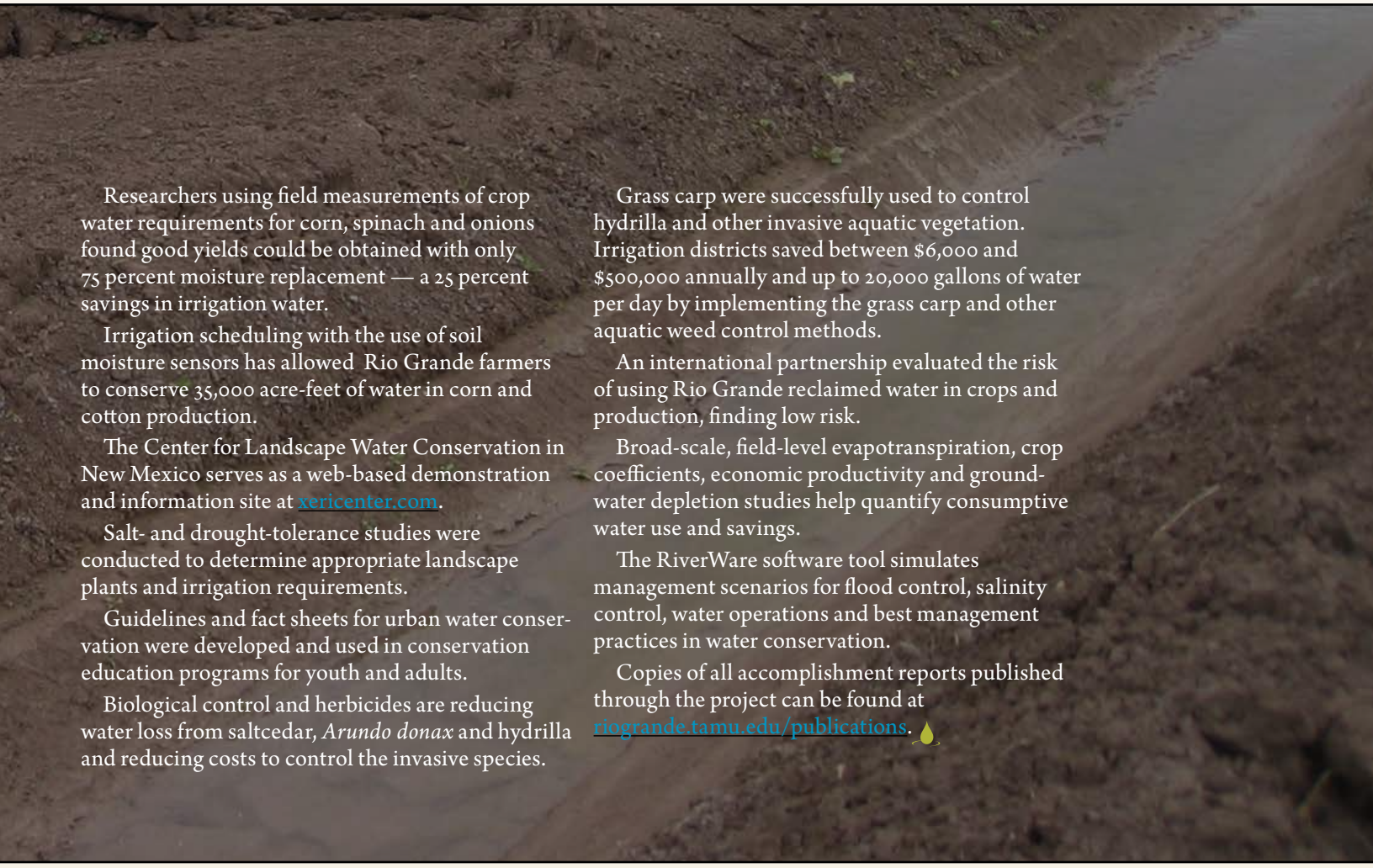
Dr. Sam Fernald, interim director of the New Mexico Water Resources Research Institute and professor in the Department of Animal and Range Sciences at New Mexico State University, said the "RGBI allowed us to respond to a big data need regarding acequias." The project allowed Fernald and other researchers to implement measurement infrastructure that helped gather the needed data to fill in the gaps on acequia effectiveness and use.

Other efforts such as controlling *Arundo donax* and saltcedar, invasive water-consuming plants along the river, have helped save water, leaving more available for the people of the basin, Lacewell said. In addition, desalination use in South Texas has grown and become competitive with municipal water production.

Project sponsor NIFA often uses data produced through RGBI because it is broad-based and applicable worldwide. The data is particularly applicable to population issues emerging in the United States, said Dr. James Dobrowolski, national program leader and RGBI project manager at NIFA. "USDA is proud of this project, and I have used a lot of this information, especially the drought information. The West Texas area is at the forefront of drought decision-making and leads the way in adapting irrigation to drought."

"Even though we can't control the natural hydrological process effectively," Sheng said, "we have made a great step forward through the RGBI program in understanding how water can be managed on farms and in urban areas once water is captured for uses."

For more information, visit *txH2O* online at twri.tamu.edu/txH2O/.



Researchers using field measurements of crop water requirements for corn, spinach and onions found good yields could be obtained with only 75 percent moisture replacement — a 25 percent savings in irrigation water.

Irrigation scheduling with the use of soil moisture sensors has allowed Rio Grande farmers to conserve 35,000 acre-feet of water in corn and cotton production.

The Center for Landscape Water Conservation in New Mexico serves as a web-based demonstration and information site at xericenter.com.

Salt- and drought-tolerance studies were conducted to determine appropriate landscape plants and irrigation requirements.

Guidelines and fact sheets for urban water conservation were developed and used in conservation education programs for youth and adults.

Biological control and herbicides are reducing water loss from saltcedar, *Arundo donax* and hydrilla and reducing costs to control the invasive species.

Grass carp were successfully used to control hydrilla and other invasive aquatic vegetation. Irrigation districts saved between $6,000 and $500,000 annually and up to 20,000 gallons of water per day by implementing the grass carp and other aquatic weed control methods.

An international partnership evaluated the risk of using Rio Grande reclaimed water in crops and production, finding low risk.

Broad-scale, field-level evapotranspiration, crop coefficients, economic productivity and groundwater depletion studies help quantify consumptive water use and savings.

The RiverWare software tool simulates management scenarios for flood control, salinity control, water operations and best management practices in water conservation.

Copies of all accomplishment reports published through the project can be found at riogrande.tamu.edu/publications.